Rolling Rye In the Upper Midwest

Erin Silva, Organic Production Specialist
University of Wisconsin, Dept of Plant Pathology
Why move to no-till?

- Soil health
- Effective weed management
Organic Yields at WICST

- 18 to 20-year means show organic systems yielding well (~90% of conventional systems)
- Organic grain crop trends are positive – yields are increasing with time

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>174 bu/ac</td>
<td>166 bu/ac</td>
</tr>
<tr>
<td>Soybean</td>
<td>52.5 bu/ac</td>
<td>47.4 bu/ac</td>
</tr>
<tr>
<td>Wheat</td>
<td>67.6 bu/ac</td>
<td>55.8 bu/ac</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>4.83 tons DM/ac</td>
<td>5 tons DM/ac</td>
</tr>
</tbody>
</table>
## Effect of weed pressure on soybean yields

<table>
<thead>
<tr>
<th></th>
<th>Wet Springs (May + June &gt; 10” rain)</th>
<th>Normal Springs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ARS</td>
<td>LAC</td>
</tr>
<tr>
<td>Conventional (min-till corn-soybean)</td>
<td>48</td>
<td>57</td>
</tr>
<tr>
<td>Organic (3-yr grain)</td>
<td>38</td>
<td>44</td>
</tr>
<tr>
<td>Org:conv</td>
<td>79%</td>
<td>76%</td>
</tr>
</tbody>
</table>
Organic Cover Crop-based Reduced-tillage

- Focused on limiting tillage in certain phases
  - Soybean phase most reliable
  - Corn phase possible?
- Use fall-planted cover crops to smother weeds
- Cover crops terminated in spring
  - Rolled-crimped or mowed
- Cash crops planted following cover crop termination
- No or limited cultivation needed for weed control
Roller-Crimper

- Ground-driven
- Can be purchased from I and J Manufacturing
- Plans on Rodale website ([www.rodaleinstitute.org](http://www.rodaleinstitute.org))
- Front or rear mounted
Typical cover crops used

- Cereal grain
  - Winter rye – adequate biomass, winter-hardiness, and allelopathy
  - Triticale?
- 3 bu/ac
- Legumes?
Ground cover on April 1st across rye seeding dates

Mirsky, USDA
Crimping must be performed at anthesis to ensure complete termination of crop with no regrowth
Bounce-back at different rolling dates

Photos taken on July 31, 2015

May 15  May 22  May 29  June 5

Rolling dates, from earliest to latest

Liebert and Ryan
Seed-to-soil contact

• Adjust seeding depth and add weight based on cover crop biomass and soil moisture
• Use closing wheels
• High planting rates

Liebert and Ryan
July 15
September 13, 2016
# Soybean Yields across Experiments

<table>
<thead>
<tr>
<th>Year</th>
<th>Till (bu/ac)</th>
<th>Cover Crop No-Till (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>47</td>
<td>30</td>
</tr>
<tr>
<td>2008/2009 (Bernstein)</td>
<td>54</td>
<td>43</td>
</tr>
<tr>
<td>2011</td>
<td>52</td>
<td>53</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td>drought</td>
</tr>
<tr>
<td>2013</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>2014</td>
<td>47</td>
<td>44</td>
</tr>
<tr>
<td>2015</td>
<td>60</td>
<td>55</td>
</tr>
<tr>
<td>2016</td>
<td>57</td>
<td>61</td>
</tr>
<tr>
<td>2017</td>
<td>48</td>
<td>47</td>
</tr>
</tbody>
</table>
Cover Crop-based Organic Reduced Tillage Trials and Demo 2017 Results

Arlington Agricultural Research Station
Overview

1. Organic no-till soybeans …
   … in winter cereals
   … in spring planted cereal rye

2. Organic no-till corn

3. Interseeding cover crops in organic corn
No-till soybeans in winter cereals

- 6 acres total
- 0.3 acre per plot (30x450ft)
- 4 cover crops, one control
- 4 replications per treatment
## Cover crops

<table>
<thead>
<tr>
<th>Species</th>
<th>Variety</th>
<th>Date</th>
<th>Rate</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triticale</td>
<td>NE426GT</td>
<td>Sept 19(^{th}), 2016</td>
<td>3bu/ac</td>
<td>1.75”</td>
</tr>
<tr>
<td></td>
<td>815</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereal Rye</td>
<td>Aroostook</td>
<td>Sept 26(^{th}), 2016</td>
<td></td>
<td>1.25”</td>
</tr>
<tr>
<td></td>
<td>Spooner</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Cover crop biomass before crimping

- Aroostook-rye – 11,212 Lbs of dry matter / acre
- Spooner-rye – 11,315
- NE426GT-triticale – 12,721
- 815-triticale – 15,137

![John Deere 1590 no-till drill](image)
Soybeans

- 1.7 Relative Maturity soybeans – 30 inches row – 225,000seed/ac - 1” deep

- 2 Planting strategies
  - *Early planting*, (planting green) in the standing cover crop at boot stage
    May 12\textsuperscript{th} - rye and control
    May 20\textsuperscript{th} – triticale
  
  - *Late planting*, planting at crimping in the rolled cover crop at anthesis
    June 2\textsuperscript{nd} - rye and control
    June 8\textsuperscript{th} - triticale
Early planting
John Deere 1750 Max Emerge Plus
Early planted soybeans

Soybean germination

Planted in standing cover crop, Seed trench not closed

Planted in bare ground, Seed trench fully closed
Late planting and crimping - modified AGCO planter - Rodale roller crimper
Modified AGCO planter

- No-till coulters
- Double disc openers
- Down pressure strings
- 1,200lbs weights
Cover crop and pests – Armyworms

• Lay eggs in grassy plants
• June 15\textsuperscript{th} Entrust\textsuperscript{®} (3oz/ac)
Overhead drone view, mid-August

Photo credits – Roger Schmidt - rwschmidt@wisc.edu
Soybean stand count (plants/acre)
Soybean yield (bushels/acre)
### Soybean Stand and Yield Ratios

<table>
<thead>
<tr>
<th></th>
<th>% Control</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early</td>
<td>Late</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stand</td>
<td>Yield</td>
<td>Stand</td>
<td>Yield</td>
<td></td>
</tr>
<tr>
<td>Aroostook</td>
<td>55</td>
<td>75</td>
<td>77</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Spooner</td>
<td>55</td>
<td>59</td>
<td>71</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>NE426GT</td>
<td>54</td>
<td>55</td>
<td>62</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>815</td>
<td>33</td>
<td>40</td>
<td>58</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

- The yield ratio is 20% higher than the stand ratio.
- 90% of the yield from 70% of the stand.

Soybean stand looked poor in NT soybeans, which seemed alarming, but they did partially compensate.
Conclusion and plans for 2018

• Not a one-fits-all system
  - Planting date – climate, number of paths, RTK
  - Cover crop variety – maturity, over-wintering capacity

• Next year
  - Early planting vs. Late planting
  - 4 Cover crops – ‘Spooner’ and ‘Aroostook’ rye, ‘NE426GT’-triticale, ‘Emmerson’ wheat
  - Economic analysis
  - Equipment modification (closing wheels, down pressure …)
Soybeans in spring-planted cereal rye

• Key principle – Vernalization
  « need for exposure to a period of cold in order to flower »

• April 12th:
  ‘Spooner’ rye, 2bu/ac, drilled at 1” deep

• May 26th:
  1.7 Relative Maturity soybeans, 250,000 seeds/ac, drilled at 1” deep
When it doesn’t work …

Stand count: 16,521 plants/ac

Yields: 21.5 bu/ac

June 19th

September 25th
When it works ...
No-till Corn - Overview

• Our program – new phase of research

• States on more southern latitude may have success with no-till corn into hairy-vetch + cereal rye

• Legume cover crop needs to be integrated for nitrogen availability and pest avoidance

• Overwintering legume that can be terminated effectively and enable to plant the corn early enough
### No-till corn – Cover crops

<table>
<thead>
<tr>
<th>Trial</th>
<th>Cover crop</th>
<th>Date</th>
<th>Rate</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>N°1</td>
<td>Lynx Peas</td>
<td>Fall - Sept 19(^{th}), 2016</td>
<td>50lbs/ac each</td>
<td>3”</td>
</tr>
<tr>
<td></td>
<td>Shelby Oats</td>
<td></td>
<td></td>
<td>1”</td>
</tr>
<tr>
<td>N°2</td>
<td>Chickling Vetch</td>
<td>Spring – April 12(^{th}), 2017</td>
<td>200lbs/ac</td>
<td>0,5”</td>
</tr>
<tr>
<td>N°3</td>
<td>4010 Field Peas</td>
<td>Spring – April 12(^{th}), 2017</td>
<td>200lbs/ac</td>
<td>0,5”</td>
</tr>
</tbody>
</table>

No cover crop in the spring
No-till corn

• 85 days corn - planted green on June 8th – 38,000 spa

• Cover crop on June 12th - 4 days after planting corn

4010 Field peas
Chickling Vetch
No-till corn

Corn development - June 19th

June 27:
Roller crimper on crover crop + corn at V1

... no picture and not a success
No-till corn - Results

NT corn in field peas on July 24th

Yields (silage at 35% DM)
Standard : 29 t/ac
No-till : 17 t/ac
Conclusion and plans for 2018

• Corn isn’t as resilient as soybeans and is more impacted by the roller crimper

• Peas and vetch termination wasn’t successful and we had poor weed suppression

• Next year
  • Fall-planted peas and oats
  • Looking for other spring-planted legumes
  • Working on other strategies for cover crop termination
Interseeding cover crop in corn

- 85 days corn and inbred corn, both planted on June 8th

- Cover crops interseeded on July 6th between corn row at V5

| Cereal rye – 180 lbs/ac | Red Clover – 10 lbs/ac | Daikon Radish – 10 lbs/ac |
Interseeding cover crop in corn - Results

- Interseeded cover crop suffered from combination of shade and drought

- Will try interseeding again

After harvest – Typical corn

After harvest – Inbred corn
Thank you for joining!

Erin Silva – emsilva@wisc.edu
Léa Vereecke – vereecke@wisc.edu

(608) 890-1503

http://www.uworganic.wisc.edu
https://ograin.triforce.cals.wisc.edu